The chemical evolution of galaxies causing damped Lyα absorption

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Abstract. We have compiled all available data on chemical abundances in damped Lyman alpha absorption systems for comparison with results from our combined chemical and spectrophotometric galaxy evolution models. Preliminary results from **chemically consistent** calculations are in agreement with observations of damped Lyα systems.

1 Models of galaxy evolution

Our model is most briefly described as kind of a synthesis of a modified Tinsley model for the chemical evolution (SN Ia treated à la Matteuchi) and a Bruzual–like model for the spectral evolution of the stellar population. Models have been improved to be **chemically consistent**, i.e. we use evolutionary tracks, yields, lifetimes and remnant masses for the metallicity calculated at the time of birth for respective stars. Metallicity dependent stellar yields and remnant masses for massive stars ($M \geq 12 * M_{\odot}$) are taken from Weaver & Woosley[5]. For lower mass stars data from van den Hoek & Groenewegen[4] are incorporated. Updated SN Ia contributions are taken from Nomoto et al.[2]. Adopting any cosmological model (H_0, Ω_0, Λ_0) and epoch of galaxy formation ($z_{\rm form}$) we obtain redshift dependent quantities (ISM abundances, spectra, etc.) which can be compared to observations.

2 Preliminary results and Conclusion

Figure 1 shows preliminary results for the abundances of zinc. A considerable part of observed DLA abundances[3][1] lies between our Sa and Sd models. In particular the chemically consistent Sd

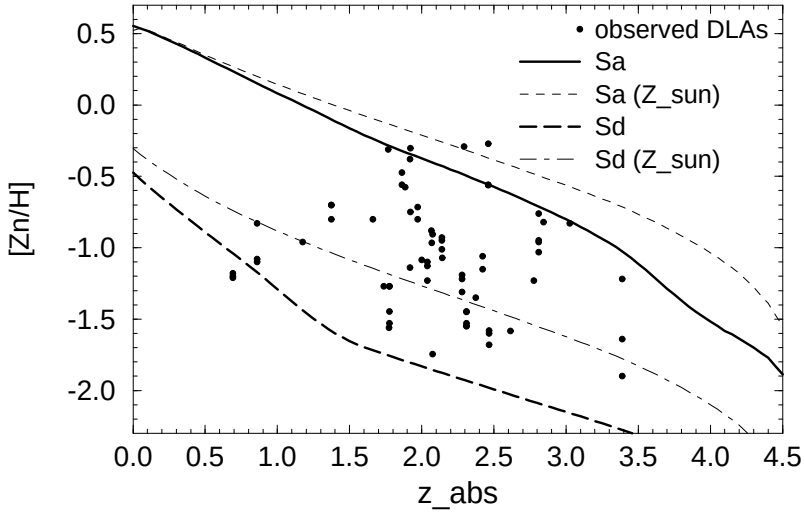

Figure 1: Comparison of zinc abundances as a function of redshift for observed DLA systems with chemically consistent calculated models and models using solar abundances throughout (Z_sun).

model fits the observational data better than the model calculated with solar abundances! The rough agreement of element abundances from our models with those for high redshift galaxies (DLA systems at $z > 1$) is an important result, because the SFR we use has been derived from comparison with photometric data of low redshift galaxies ($z < 1$). The appreciable number of precise DLA abundances now available enables us for the first time to compare results of our chemical evolution models with high redshift ($z > 1$) galaxies.

References

[1] Lu, L., et al., 1996, ApJS 107, 475

[2] Nomoto, K., et al., 1997, preprint astro-ph/9706025

[3] Pettini, M., et al., 1997, ApJ 486, 665

[4] van den Hoek, L.B., & Groenewegen, M.A.T., 1997, A&A Suppl. 123, 305

[5] Woosley, S.E. & Weaver, T.A., 1995, ApJS 101, 181